# (12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization International Bureau





(43) International Publication Date 15 November 2001 (15.11.2001)

PCT

(10) International Publication Number WO 01/85208 A3

- (51) International Patent Classification<sup>7</sup>: A61K 39/385, A61P 37/00 // C12N 15/33, 15/51, 15/31, 15/30, 15/62, C07K 14/245, 14/02, 19/00
- (21) International Application Number: PCT/IB01/00741
- (22) International Filing Date: 2 May 2001 (02.05.2001)
- (25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data: 60/202,341

5 May 2000 (05.05.2000) U

(71) Applicant: CYTOS BIOTECHNOLOGY AG [CH/CH]; Wagistrasse 21, CH-8952 Zürich-Schlieren (CH).

(71) Applicants and

(72) Inventors: SEBBEL, Peter [DE/CH]; Schulstrasse 36, CH-8050 Zürich (CH). DUNANT, Nicolas [CH/CH]; Malzgasse 14, CH-4052 Basel (CH). BACHMANN, Martin [CH/CH]; Tachlis Brunnenstrasse 30, CH-8400 Winterthur (CH). TISSOT, Alain [CH/CH]; Brauerstrasse 78, CH-8004 Zürich (CH). LECHENER, Franziska [CH/CH]; Froschaugasse 12, CH-8001 Zürich (CH).

- (74) Agent: GOLDSTEIN, Jorge, A.; Sterne, Kessler, Goldstein & Fox P.L.L.C., Suite 600, 1100 New York Avenue N.W., Washington, DC 20005-3934 (US).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

#### Published:

- with international search report
- (88) Date of publication of the international search report: 23 May 2002

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

85208 A3

(54) Title: MOLECULAR ANTIGEN ARRAYS AND VACCINES

(57) Abstract: The invention provides compositions and processes for the production of ordered and repetitive antigen or antigenic determinant arrays. The compositions of the invention are useful for the production of vaccines for the prevention of infectious diseases, the treatment of allergies and the treatment of cancers. Various embodiments of the invention provide for a core particle that is coated with any desired antigen in a highly ordered and repetitive fashion as the result of specific interactions.

### "TERNATIONAL SEARCH REPORT

Ir .ational Application No PCT/IB 01/00741

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 A61K39/385 A61P37/00 //C12N15/33,C12N15/51,C12N15/31,C12N15/30,C12N15/62,C07K14/245,C07K14/02,C07K19/00

According to International Patent Classification (IPC) or to both national classification and IPC

### **B. FIELDS SEARCHED**

١.

Minimum documentation searched (classification system followed by classification symbols) IPC  $\,\,7\,\,$  A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, BIOSIS

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No.                       |
|------------|---|---|
| X          | EP 0 578 293 A (AKZO NV)<br>12 January 1994 (1994-01-12)<br>page 3, line 35 - line 58   | 1-5,<br>11-15,<br>45-60,<br>79,80,<br>83-85 |
| A          | BACHMANN M F ET AL: "The influence of virus structure on antibody responses and virus serotype formation" IMMUNOLOGY TODAY, vol. 17, no. 12, 1 December 1996 (1996-12-01), pages 553-558, XP004071007 |   |

| X Further documents are listed in the continuation of box C.  | Patent family members are listed in annex.  |
|---|---|
| Special categories of cited documents:  'A' document defining the general state of the art which is not considered to be of particular relevance  'E' earlier document but published on or after the international filing date  'L' document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)  'O' document referring to an oral disclosure, use, exhibition or other means  'P' document published prior to the international filing date but later than the priority date claimed | <ul> <li>*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention.</li> <li>*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone.</li> <li>*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</li> <li>*&amp;* document member of the same patent family</li> </ul> |
| Date of the actual completion of the international search 25 February 2002  | Date of mailing of the international search report 05/03/2002   |
| Name and malling address of the ISA  European Patent Office, P.B. 5818 Patentlaan 2  NL – 2280 HV Rijswijk  Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  Fax: (+31-70) 340-3016  | Authorized officer Teyssier, B  |

Form PCT/ISA/210 (second sheet) (July 1992)

1

### INTERNATIONAL SEARCH REPORT

Ir. ational Application No
PCT/IB 01/00741

| C.(Continua | tion) DOCUMENTS CONSIDERED TO BE RELEVANT  | 101/10 01/00/41                               |  |  |
|-------------|--|---|--|--|
| Category *  | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No.                         |  |  |
| Р,Х         | WO 00 32227 A (CYTOS BIOTECHNOLOGY AG)<br>8 June 2000 (2000-06-08)                 | 28-44,<br>48-56,<br>61,62,<br>78-80,<br>83-85 |  |  |
|             | the whole document   | 83-85   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
| İ           |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
| İ           |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
| 1           |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
| 1           |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
| }           |  |   |  |  |
|             |  |   |  |  |
|             |  |   |  |  |
|             | ·  |   |  |  |
|             | •  |   |  |  |
|             |  |   |  |  |

1

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-27, 45-47, 57-60, 63-77, 81, 82 (in totality); 48-56, 61, 62, 78-80, 83-85 (partially)

Compositions comprising a bacterial pili covalently linked to an antigen; methods of making these compositions; methods of immunisation using these compositions.

2. Claims: 28-44 (in totality); 48-56, 61, 62, 78-80, 83-85 (partially)

Compositions comprising a virus-like molecular scaffold; methods of making these compositions; methods of immunisation using these compositions.

### INTERNATIONAL SEARCH REPORT

Information on patent family members

ti ational Application No
PCT/IB 01/00741

|  |   |                     |    | 101/18 01/00/41            |                  |  |
|--|---|---------------------|----|----------------------------|------------------|--|
| Patent document cited in search report |   | Publication<br>date |    | Patent family<br>member(s) | Publication date |  |
| EP 0578293                             | Α | 12-01-1994          | EP | 0578293 A1                 | 12-01-1994       |  |
|  |   |                     | ES | 2142848 T3                 | 01-05-2000       |  |
|  |   |                     | GR | 3033086 T3                 | 31-08-2000       |  |
|  |   |                     | ΑT | 188737 T                   | 15-01-2000       |  |
|  |   |                     | AU | 4134393 A                  | 23-12-1993       |  |
|  |   |                     | BR | 9302408 A                  | 11-01-1994       |  |
|  |   |                     | CA | 2098533 A1                 | 19-12-1993       |  |
|  |   |                     | DE | 69327553 D1                | 17-02-2000       |  |
|  |   |                     | DE | 69327553 T2                | 10-08-2000       |  |
|  |   |                     | DK | 578293 T3                  | 26-06-2000       |  |
|  |   |                     | HU | 68554 A2                   | 28-06-1995       |  |
|  |   |                     | JP | 6056696 A                  | 01-03-1994       |  |
|  |   |                     | MX | 303646 A1                  | 31-05-1994       |  |
|  |   |                     | ΝZ | 247907 A                   | 22-12-1994       |  |
|  |   |                     | PT | 578293 T                   | 30-06-2000       |  |
|  |   |                     | US | 5684145 A                  | 04-11-1997       |  |
|  |   |                     | US | 6019983 A                  | 01-02-2000       |  |
|  |   |                     | ZA | 9304199 A                  | 10-01-1994       |  |
| WO 0032227                             | Α | 08-06-2000          | AU | 1402000 A                  | 19-06-2000       |  |
|  |   |                     | BR | 9915771 A                  | 26-12-2001       |  |
|  |   |                     | CN | 1333693 T                  | 30-01-2002       |  |
|  |   |                     | EP | 1135162 A2                 | 26-09-2001       |  |
|  |   |                     | WO | 0032227 A2                 | 08-06-2000       |  |